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1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as it is.

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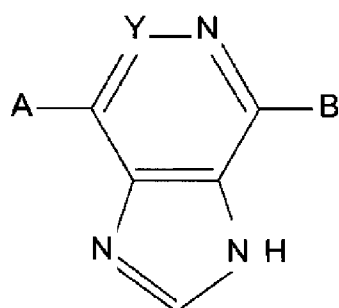
[Document Name]Description

[Title of the Invention]Organic electroluminescence light emitting element

[Claim(s)]

[Claim 1]An organic electroluminescence light emitting element containing a compound which is the organic electroluminescence light emitting element in which an organic luminous layer which has a luminescence field was provided and by which said organic luminous layer is expressed with following general formula (I) to inter-electrode [two].

[Chemical formula 1]

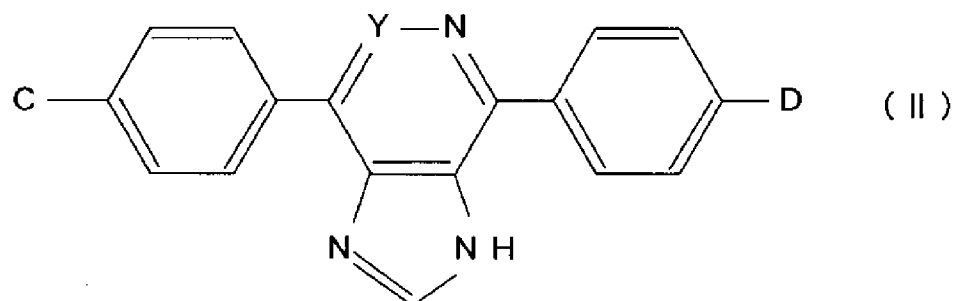


(I)

A and B show among a formula an aromatic hydrocarbon machine which may have a substituent, and B may be the same as A, or may differ from each other. Y shows a carbon atom which may have a substituent.

[Claim 2]An organic electroluminescence light emitting element containing a compound which is the organic electroluminescence light emitting element in which an organic luminous layer which has a luminescence field was provided and by which said organic luminous layer is expressed with following general formula (II) to inter-electrode [two].

[Chemical formula 2]



C and D show among a formula an aromatic series machine which contains in a ring a hetero atom which may have a heterocyclic machine or a substituent which may have an aromatic hydrocarbon machine or a substituent which may have a substituent, and D may be the same as C, or may differ from each other. Y shows a carbon atom which may have a substituent.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the organic electroluminescence light emitting element (it may be hereafter written as an organic electroluminescence light emitting element.) used for the light emitting element etc. which are used for the light source of various display devices or a display device, backlight, or optical-communications apparatus.

[0002]

[Description of the Prior Art]An electroluminescence light emitting element is a luminescence device using electric field luminescence of the solid fluorescence substance, The inorganic electroluminescence light emitting element using the present inorganic matter type material as

a photogen is put in practical use, and application deployment to backlight, a flat display, etc. of a liquid crystal display is achieved partly. However, its voltage required in order to make light emit is as high as more than 100V, and since blue luminescence is moreover difficult for an inorganic electroluminescence light emitting element, full-color-izing by the three primary colors of RGB is difficult for it.

[0003]On the other hand, although the research on the electro RUMINESSEN light emitting element using organic materials also attracted attention for many years and various examination had been performed, luminous efficiency did not progress to full-fledged utilization research from a very bad thing.

[0004]However, the organic electroluminescence light emitting element which will have the lamination structure of the functional discrete type which divided organic materials into two-layer [of an electron hole transportation layer and a luminous layer] by C.W.Tang and others of Kodak in 1987 is proposed, It became clear that green luminescence more than 1000 cd/m^2 is obtained in spite of the low voltage not more than 10V. [Refer to C.W.Tang and S.A.Vanslyke:Appl.Phys.Lett and 51 (1987) 913 grade.] .

[0005]However, the hue of luminescence could not be chosen freely but there was a limit also in the luminosity of luminescence. The organic electroluminescence light emitting element is studied and developed at the time of this announcement by many researchers. However, research and development of the blue luminescent material for obtaining 3 colors of RGB(s) had reached to an extreme of difficulty most. For example, the luminescent material of Yellow Green is developed as indicated to JP,4-275268,A. According to this, it is green and high-intensity can be attained, but there is no reference about a blue luminescent material. The material which emits light by blue and blue-green is developed as indicated to JP,4-332787,A. According to this, although the efficient blue luminescent material is producible, there is no description about a life.

[0006]When the conventional organic electroluminescence light emitting element is explained, here, [the conventional organic electroluminescence light emitting element] Substrates, such as glass, and the anode which consists of transparent conductive films, such as ITO formed by the sputtering method, the resistance heating vapor-depositing method, etc. on the substrate,

The electron hole transportation layer which consists of N formed by the resistance heating vapor-depositing method etc. on the anode, N'-diphenyl N and N'-bis(3-methylphenyl)-1, 1'-diphenyl 4 and 4'-Gua Min (it is hereafter called TPD for short.), etc., The luminous layer which consists of 4 and 4'-bis(2 and 2'-diphenyl vinyl)biphenyl (it is hereafter called DPVBi for short.) etc. which were formed by the resistance heating vapor-depositing method etc. on the electron hole transportation layer, It has the negative pole which consists of a metal membrane of the film thickness (100 nm - 300 nm) formed by the resistance heating vapor-depositing method etc. on the luminous layer.

[0007]By sending direct-current current between the anode of an organic electroluminescence light emitting element which has the above-mentioned composition, and the negative pole, an electron hole is poured into a luminous layer via an electron hole transportation layer from an anode, and an electron is poured into a luminous layer from the negative pole. In the luminous layer, re-combination of an electron hole and an electron arises and an exciton occurs in connection with this, and when this exciton falls to a ground state, it is based on the principle referred to as releasing that energy as a light.

[0008]

[Problem to be solved by the invention]In the efficient organic electroluminescence light emitting element of the conventional blue luminescence, when constant voltage or constant current is impressed and light was made to emit continuously, luminescence luminosity declined temporally, and continuation luminescence time had the technical problem that it was short and the variation per hour of a tint arose. When making white profitably like, methods, such as carrying out color conversion of the blue luminescence from the combination of the material which combines the luminescent material which emits light in blue, green, red, etc., or emits light in blue and yellow, or a blue luminescent material by letting a fluorescent substance pass, are known, but. The method of combining various luminescent materials had the technical problem that a luminescence color changed with degradation. Since the method of carrying out color conversion had bad conversion efficiency, power consumption becomes large or there was a problem of a manufacturing cost going up.

[0009]This invention solves the above-mentioned conventional technical problem, and it is an

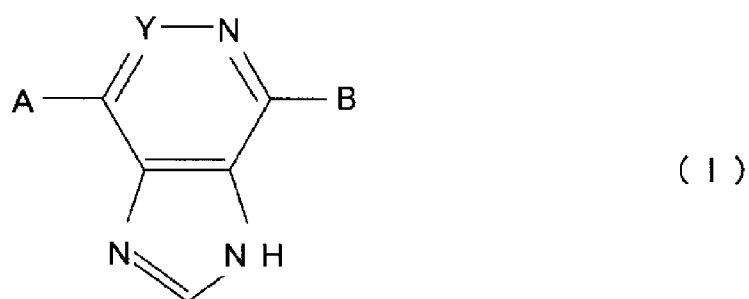
efficient organic electroluminescence light emitting element in which blue luminescence and white luminescence by a single luminescent material are possible, It is producible at low cost for a single material, and it is stabilized by high luminescence luminosity for a long time, and aims at offer of the organic electroluminescence light emitting element in which continuation luminescence is possible.

[0010]

[Means for solving problem]In order to solve the above-mentioned technical problem, [the organic electroluminescence light emitting element of this invention] It is considered as the organic electroluminescence light emitting element containing the compound which is the organic electroluminescence light emitting element in which the organic luminous layer which has a luminescence field was provided and by which an organic luminous layer is expressed with following general formula (I) to inter-electrode [two],

[0011]

[Chemical formula 3]



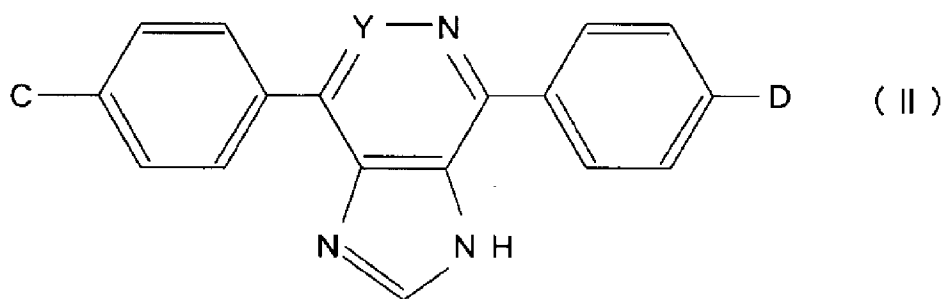
[0012]A and B show among a formula the aromatic hydrocarbon machine which may have a substituent, and B may be the same as A, or may differ from each other. Y shows the carbon atom which may have a substituent. As for the EL luminescence of the compound expressed with general formula (I) to a surprising thing, blue and white were obtained. By this composition, the efficient organic electroluminescence light emitting element of blue

luminescence and white luminescence can create at low cost by a single luminescent material, and it can be stabilized by high luminescence luminosity for a long time, and can have the operation that continuation luminescence is possible and there is no variation per hour of a tint.

[0013][the organic electroluminescence light emitting element of this invention] It is considered as the organic electroluminescence light emitting element containing the compound which is the organic electroluminescence light emitting element in which the organic luminous layer which has a luminescence field was provided and by which an organic luminous layer is expressed with following general formula (II) to inter-electrode [two],

[0014]

[Chemical formula 4]



[0015]C and D show among a formula the aromatic series machine which contains in a ring the hetero atom which may have the heterocyclic machine or substituent which may have the aromatic hydrocarbon machine or substituent which may have a substituent, and D may be the same as C, or may differ from each other. Y shows the carbon atom which may have a substituent. Compared with the compound by which blue and white are obtained and are expressed with general formula (I), as for the EL luminescence of the compound expressed with general formula (II) to a surprising thing, still higher efficiency and long lasting EL device are obtained. By this composition, the efficient organic electroluminescence light emitting element of blue luminescence and white luminescence can create at low cost by a single luminescent material, and it can be stabilized by high luminescence luminosity for a long time,

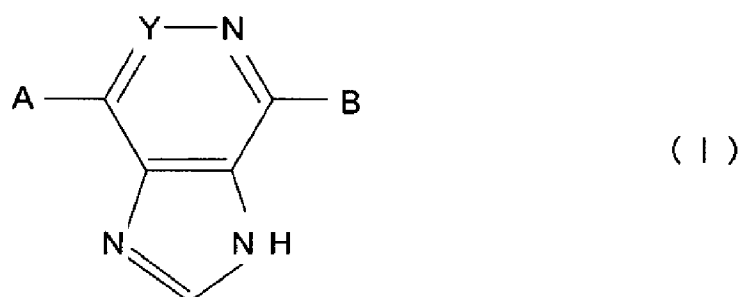
and can have the operation that continuation luminescence is possible and there is no variation per hour of a tint.

[0016]

[Mode for carrying out the invention]It is an organic electroluminescence light emitting element, wherein the invention according to claim 1 contains the compound which is the organic electroluminescence light emitting element in which the organic luminous layer which has a luminescence field was provided and by which an organic luminous layer is expressed with following general formula (I) to inter-electrode [two],

[0017]

[Chemical formula 5]

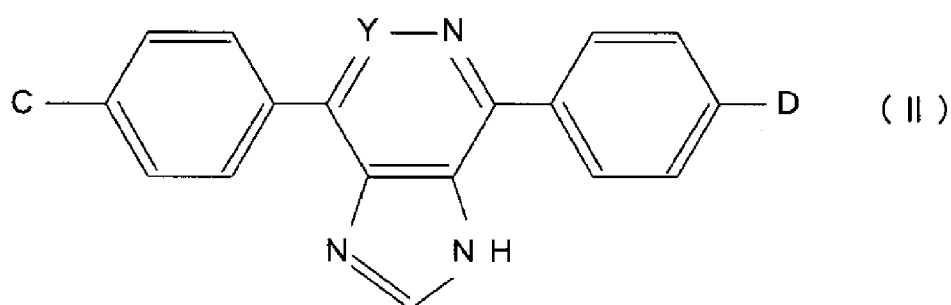


[0018]A and B show among a formula the aromatic hydrocarbon machine which may have a substituent, and B may be the same as A, or may differ from each other. Y shows the carbon atom which may have a substituent. With this composition, The efficient organic electroluminescence light emitting element of blue luminescence and white luminescence can create at low cost by a single luminescent material, and it can be stabilized by high luminescence luminosity for a long time, and can have the operation that continuation luminescence is possible and there is no variation per hour of a tint.

[0019] It is an organic electroluminescence light emitting element, wherein the invention according to claim 2 contains the compound which is the organic electroluminescence light emitting element in which the organic luminous layer which has a luminescence field was provided and by which an organic luminous layer is expressed with following general formula (II) to inter-electrode [two],

[0020]

[Chemical formula 6]



[0021] C and D show among a formula the aromatic series machine which contains in a ring the hetero atom which may have the heterocyclic machine or substituent which may have the aromatic hydrocarbon machine or substituent which may have a substituent, and D may be the same as C, or may differ from each other. Y shows the carbon atom which may have a substituent. With this composition, The very efficient organic EL device of blue luminescence and white luminescence can create at low cost by a single luminescent material, can be stabilized by high luminescence luminosity for a long time, and it can have the operation that continuation luminescence is possible and there is no variation per hour of a tint.

[0022] Hereafter, the organic electroluminescence light emitting element of this invention is explained in detail.

[0023] (Embodiment) Drawing 1 is an important section sectional view of the organic electroluminescence light emitting element in the 1 embodiment of this invention, and, as for

an anode and 3, 1 is [a luminous layer and 5] the negative poles an electron hole transportation layer and 4 a substrate and 2 in drawing 1.

[0024]And when the organic electroluminescence light emitting element of this invention sends direct-current current between two electrodes (the anode 2 and negative pole 5), an electron hole is poured into the luminous layer 4 via the electron hole transportation layer 3 from the anode 2, and an electron is poured into the luminous layer 4 from the negative pole 5. In the luminous layer 4, re-combination of an electron hole and an electron arises and an exciton occurs in connection with this, and when this exciton falls to a ground state, it is based on the principle referred to as releasing that energy as a light.

[0025]Next, each composition of the organic electroluminescence light emitting element of this invention is explained.

[0026]First, the substrate 1 is explained. A transparent or translucent board can be used as the substrate 1 of an organic electroluminescence light emitting element. In this invention, a transparent or translucent definition shows the transparency of the grade which does not bar visual recognition of luminescence by an organic electroluminescence light emitting element.

[0027]Soda lime glass transparent or translucent as a substrate material, barium strontium content glass, Inorganic glass, such as inorganic oxide glass, such as glass of lead, aluminosilicate glass, borosilicate glass, barium borosilicate glass, and silica glass, and inorganic fluoride glass, Or transparent or translucent polyethylene terephthalate, polycarbonate, Poly methyl methacrylate, polyether sulphone, polyvinyl fluoride, High polymer films, such as polypropylene, polyethylene, poly acrylate, amorphous polyolefin, and fluororesin etc., Or transparent or translucent As_2S_3 , $As_{40}S_{10}$, KARUKOGENO, such as S_{40} germanium₁₀, -- an id -- glass, ZnO, and Nb_2O_5 . It can choose from materials, such as metal oxides, such as Ta_2O_5 , SiO, Si_3N_4 , HfO_2 , and TiO_2 , and a nitriding thing, suitably, and can use, and the multilayer substrate which laminated two or more substrate materials can also be used. The substrate 1 may be opaque when not taking out extraction of the light of an organic electroluminescence light emitting element from the substrate 1 side (i.e., when taking out from the negative pole 5 side in drawing 1). The circuit which consists of the transistor for

driving an organic electroluminescence light emitting element, a diode, resistance, a capacitor inductor, etc. may be formed in the inside of the surface of this substrate 1, or a substrate.

[0028]Next, the anode 2 is explained. The anode 2 is an electrode which pours in an electron hole, and needs to pour an electron hole into the luminous layer 4 or the electron hole transportation layer 3 efficiently. A transparent electrode can be used as the anode 2. As a material of a transparent electrode, metal oxides, such as indium tin oxide (ITO), tin oxide (SnO_2), and a zinc oxide (ZnO), Or the transparent conductive film which consists of mixtures, such as SnO:Sb (antimony) and ZnO:aluminum (aluminum), Or metal thin films, such as metal thin films, such as aluminum (aluminum) of the thickness of the grade which does not spoil transparency, Cu (copper), Ti (titanium), and Ag (silver), a mixed thin film of these metal, and a lamination thin film, or conductive polymers, such as polypyrrole, can be used. It is also possible to consider it as a transparent electrode by laminating two or more above-mentioned transparent electrode materials, and it forms by various kinds of polymerizing methods, such as resistance heating vapor deposition, electron beam vapor deposition, a sputtering method, or the electric field polymerizing method. When using metal oxide particulates, conductive resin fine powder, etc. as a conductive polymer, it can also form by distributing in suitable binder resin solution and applying on a substrate. In the case of conductive resin, a thin film can also be directly formed on a substrate by electric field polymerization. As for a transparent electrode, in order to give sufficient conductivity, or in order to prevent uneven luminescence by unevenness of a substrate face, it is desirable to use a thickness of 1 nm or more. In order to give sufficient transparency, it is desirable to use a thickness of 500 nm or less. As for the anode 2, although it changes with transparency to need, when transparency is needed, it is desirable for the transmissivity to visible light or a luminescence wavelength area to penetrate not less than 80% preferably not less than 60%. In this case, 50-10000 Å of thickness is about 100-5000 Å preferably. When it may be opaque, the anode 2 may be the same as that of the substrate 1.

[0029]As the anode 2, besides said transparent electrode, Cr (chromium), nickel (nickel), A big metal of work functions, such as Cu (copper), Sn (tin), W (tungsten), Au (Fri.), and Pt (platinum), or its alloy, an oxide, etc. can be used, and the lamination structure by two or more materials which used these anodes material can also be used. When not using a transparent electrode as the anode 2, the negative pole 5 should just be a transparent electrode. In this case, as for the anode 2, forming with the material which reflects light is preferred.

[0030]An amorphous carbon film may be provided in the anode 2. In this case, it both has a function as an electron hole pouring electrode. That is, an electron hole is poured into the luminous layer 4 or the electron hole transportation layer 3 via an amorphous carbon film from the anode 2. A sputtering method comes to form an amorphous carbon film between the anode 2, the luminous layer 4, or the electron hole transportation layer 3. Although there are isotropic graphite, anisotropy graphite, glass-like carbon, etc. and it does not limit in particular as a carbon target by sputtering, isotropic graphite with high purity is suitable. If the point that the amorphous carbon film is excellent is shown concretely, when the work function of an amorphous carbon film will be measured using Riken Keiki 1 [surface analysis device AC-], the work function of an amorphous carbon film is $W_c=5.40\text{eV}$. Here, since the work function of ITO generally well used as an anode is $W_{\text{ITO}}=5.05\text{eV}$, it can pour in an electron hole more efficient [it / to use an amorphous carbon film] in a luminous layer or the electron hole transportation layer 3. When forming an amorphous carbon film by the sputtering method, in order to control the electrical resistance value of an amorphous carbon film, reactive sputtering is carried out under the mixed gas atmosphere of nitrogen or hydrogen, and argon, or nitrogen-gas-atmosphere mind. In the thin film formation art by the sputtering method etc., although it changes a little with materials, if film thickness shall be 5 nm or less about, a film will serve as island-shape structure and a homogeneous film will not be obtained. Therefore, in 5 nm or less, efficient luminescence is hard to obtain the film thickness of an amorphous carbon film, and the effect of an amorphous carbon film is not sometimes remarkable. When the film thickness of an amorphous carbon film shall be not less than 200 nm, a membranous color is tinged with black and luminescence from an organic luminous layer stops fully penetrating.

[0031]Next, the electron hole transportation layer 3 is explained. As the electron hole transportation layer 3, hole mobility is high, it is transparent and the good thing of membrane formation nature is preferred. The electron hole transportation layer 3 is formed from the compound which can convey the electron hole from an anode in the direction of the luminous layer 4 efficiently in inter-electrode [which was able to give the electric field]. the electron hole pouring efficiency from the anode 2 being high, and as an electron hole pouring transportation compound, [efficiency] It is required to be a compound which can convey the poured-in electron hole efficiently, for that purpose, ionization potential is larger than the anode 2, and moreover hole mobility is large, and also it is preferred that the impurities which are excellent in stability and serve as a trap are compounds which are hard to generate at the time of manufacture and use. The compound which prevented movement into the electronic injection layer or electronic transportation material of an exciton generated by the luminous layer 4, and

was excellent in thin film organization potency is mentioned. Specifically PORUFIN, tetraphenyl PORUFIN copper besides TPD, Porphyrin compounds, such as phthalocyanine, copper phthalocyanine, and titanium phthalocyanine oxide, 1 and 1-bis{4-(G P-tolylamino) phenyl} cyclohexane, 4, 4', 4''-bird methyl bird phenylamine, N, N, N', N'-tetrakis (P-trill)-P-Feni range amine, 1-(N and N-G P-tolylamino) NAFUTAREN, 4, and 4'- bis(dimethylamino)-2-2'-JIMECHIRU bird phenyl methane, N, N, N', N' - tetra-phenyls 4 and 4'-JIAMINO biphenyl, N and N'-diphenyl N and N' - G m-trill 4,N,N-diphenyl N and N'-bis(3-methylphenyl)-1 and 1'-4, 4'-Gia Min, Aromatic series tertiary amines, such as 4'-JIAMINO biphenyl and N-phenyl carbazole, and 4-G P-tolylamino SUCHIRUBEN, 4-(G P-tolylamino)-4' - [4-(G P-tolylamino) styryl] A stilbene compound and bird azole derivatives, such as SUCHIRUBEN, and an OKISAJIAZORU derivative, An imidazole derivative, a PORIA reel alkane derivative, and a pyrazoline derivative, A pyrazolone derivative, a phenylene diamine derivative, and an annealing amine derivative, An amino substitution chalcone derivative, an OKISAZORU derivative, and a styryl anthracene derivative, A fluorenone derivative, a hydrazone derivative, the Syros Zhang derivative, a polysilane system aniline system copolymer, polymer oligomer, a styryl amine compound, an aromatic series JIMECHIRIDIN system compound, and organic materials, such as poly 3-methylthiophene, are used. The electron hole transportation layer of a polymer dispersal system which distributed the organic materials for low-molecular electron hole transportation layers is also used into polymers, such as polycarbonate.

[0032]As film thickness of the electron hole transportation layer 3, generally, it is 300-1000Å preferably, and 50-3000 Å of vacuum evaporation methods and the sputtering methods are used as the formation method.

[0033]Next, although the luminous layer 4 is explained briefly, the details about the compound which is the feature of this invention contained in the luminous layer 4 are mentioned later. The luminous layer 4 is an organic luminous layer provided with the luminescence field in the layer at least. As shown in drawing 1, the luminous layer 4 is laminated on the electron hole transportation layer 3, but when not forming the electron hole transportation layer 3, the anode 2 laminates. This luminous layer 4 serves as the role which brings about luminescence in the case of re-combination of the role, electron hole, and electron which convey the electron from the negative pole 5 in the direction of the electron hole transportation layer 3 simultaneously.

[0034]The negative pole 5 is explained. The negative pole 5 is an electrode which pours in an

electron, and needs to inject an electron into the luminous layer 4 or an electron transport layer efficiently. Generally the oxide of metal, such as small aluminum (aluminum) of a work function, In (indium), Mg (magnesium), Ti (titanium), Ag (silver), Ca (calcium), and Sr (strontium), or such metal, fluoride and its alloy, a layered product, etc. are used. And as for the negative pole 5, when using a transparent electrode as the anode 2, forming with the material which reflects light is preferred.

[0035]It is forming the high super-thin film of a light transmittance state which used a small metal of the work function for the interface which touches the luminous layer 4 or an electron transport layer as the negative pole 5, and laminating a transparent electrode in the upper part, and it is also possible to form a transparent negative electrode. Lamination structures, such as LiO_2 /aluminum, such as small Mg of especially a work function, a Mg-Ag alloy, an aluminum-Li alloy and a Sr-Mg alloy given in JP,H5-121172,A or an aluminum-Sr alloy, and an aluminum-Ba alloy, and LiF/aluminum, are preferred as a negative pole material.

[0036]As a method for film deposition of these negative poles 5, resistance heating vapor deposition, electron beam vapor deposition, and a sputtering method are used.

[0037]At least one side of the anode 2 and the negative pole 5 should just be a transparent electrode. Although it may be both transparent electrodes, if one side is a transparent electrode in order to raise the extraction efficiency of light, it is preferred that another side forms with the material which reflects light.

[0038]The two-layer structure of the electron hole transportation layer 3, the luminous layer 4 or the luminous layer 4, and an electron transport layer and which structure of the three-tiered structure of the electron hole transportation layer 3, the luminous layer 4, and an electron transport layer may be sufficient besides the monolayer structure of only the luminous layer 4. However, in the case of such a two-layer structure or a three-tiered structure, it laminates and is formed so that the electron hole transportation layer 3, the anode 2, or an electron transport layer and the negative pole 5 may touch.

[0039]As an electron transport layer, oxadiazole derivatives, such as 1,3-bis(4-tert-

buthylphenyl 1,3,4-oxadiazolyl)phenylene (OXD-7), an anthra KINOJI methane derivative, a diphenyl quinone derivative, etc. are used.

[0040]An organic electroluminescence light emitting element may be intercepted from the open air, in order to guarantee stability for a long time, a protective film may be formed on the negative pole 5 if needed, and it may protect so that the layered product of the anode 2 - the negative pole 5 may be wrapped in on the substrate 1. As a material of a protective film, SiON, SiO, SiN, SiO₂, The thin film which consists of inorganic oxides, such as aluminum₂O₃ and LiF, an inorganic nitriding thing, and inorganic fluoride, The polymer material etc. of the Silang system with resin of the glass membrane which consists of those mixtures, such as an inorganic oxide, an inorganic nitriding thing, and inorganic fluoride, or thermosetting, and optical hardenability, or the closure effect are mentioned, and it is formed by the applying methods, such as vapor deposition and sputtering.

[0041]It is also possible to laminate the organic electroluminescence light emitting element of this invention on the structure 1 which the layer composition of drawing 1 has reversed, i.e., a substrate, in order of the negative pole 5, the luminous layer 4, the electron hole transportation layer 3, and the anode 2, and at least one side is able to provide the organic electroluminescence light emitting element of this invention between two substrates with high transparency.

[0042]Which method of the wet forming-membranes methods, such as the dry type forming-membranes methods, such as vacuum deposition, CVD, and sputtering, or spin coating, and dipping, may be used for each layer of the organic electroluminescence light emitting element of this invention. Although the film thickness in particular of each layer is not limited, it needs to set each layer as the optimal film thickness. Impressed electromotive force big [when film thickness is too thick] in order to obtain fixed optical power is needed, efficiency worsens, if film thickness is too thin, a pinhole etc. occur and short-circuit and sufficient luminescence may not be obtained. Although film thickness changes considerably with kinds of each layer, the usual film thickness is used in general in 10A - 1000 A.

[0043]Although the material which forms each layer is dissolved or distributed to solvents, such as chloroform, a tetrahydro franc, toluene, xylene, and dioxane, in the case of the wet forming-

membranes method and a thin film is formed, the solvent in particular is not limited. Also in which thin film, it is preferred on a membrane formation disposition to use suitable resin and additive agent for pinhole prevention of a film etc. As such resin, polystyrene, poly car PONETO, poly arylate, Polyester, polyamide, polyurethane, polysulfone, poly methyl methacrylate, Conductive resin, such as photo electroconductive polymer, such as insulating resin, such as polymethyl acrylate and cellulose, a Polly N-vinyl KARUBA sole, and polysilane, poly CHIOFEN, and polypyrrole, can be mentioned.

[0044]It can be used for the organic electroluminescence light emitting element of this invention as a display device which displays a picture, for example, and, [these display devices] It can use for the display of AV equipment, such as a display of Personal Digital Assistants, such as a cellular phone, PHS, and PDA, a display of Television Sub-Division, a personal computer, car navigation, etc., a stereo, and radio, etc. It can use for the lighting installation as light sources, such as a laser printer and a scanner. Or it can also use as a lighting installation as a mere light source like lights, such as an interior light and the right stand.

[0045]If predominancy, like the low power consumption of an organic electroluminescence element, ease [lightweight slimming down], and speed of response are quick is taken into consideration also in these, It is preferred to use for the lighting installation as light sources, such as a display device as a display which displays a picture in various electronic equipment, a laser printer, a scanner.

[0046]In the above, although each composition of the organic electroluminescence light emitting element in an embodiment of the invention was explained, the characteristic compound of this invention contained in the luminous layer 4 is explained in detail here.

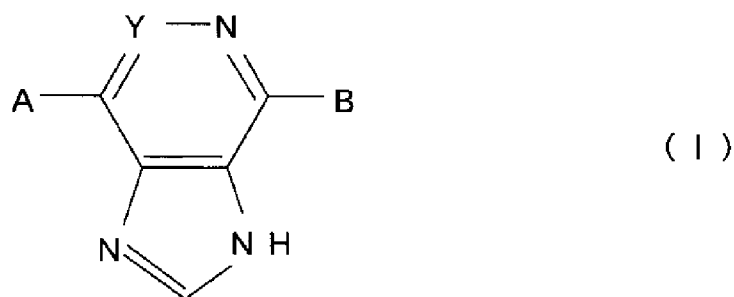
[0047]First, the 1st compound of this invention denoted by following general formula (I) contained in the luminous layer 4 of the organic electroluminescence light emitting element of this invention is explained.

[0048]The organic electroluminescence light emitting element of this invention contains the

compound by which the luminous layer 4 is expressed with following general formula (I).

[0049]

[Chemical formula 7]



[0050] In general formula (I), A and B show the aromatic hydrocarbon machine which may have a substituent, are chosen from a phenyl group, a naphthyl group, a phenanthrene machine, etc., and, [as a substituent] The alkyl group of the carbon numbers 1-6, such as a chlorine atom, a bromine atom, iodine Hitoshi Harako's halogen atom, a methyl group, and an ethyl group, The alkoxycarbonyl group which has an alkoxy group of the carbon numbers 1-6, such as an alkoxy group; methoxy carbonyl group of the carbon numbers 1-6, such as a methoxy group and an ethoxy basis;; A methoxy sulfonyl group, The alkoxy sulfonyl group of the carbon numbers 1-6, such as an ethoxy sulfonyl group; a cyano group, an amino group, a dimethylamino group, a nitro group, etc. are raised.

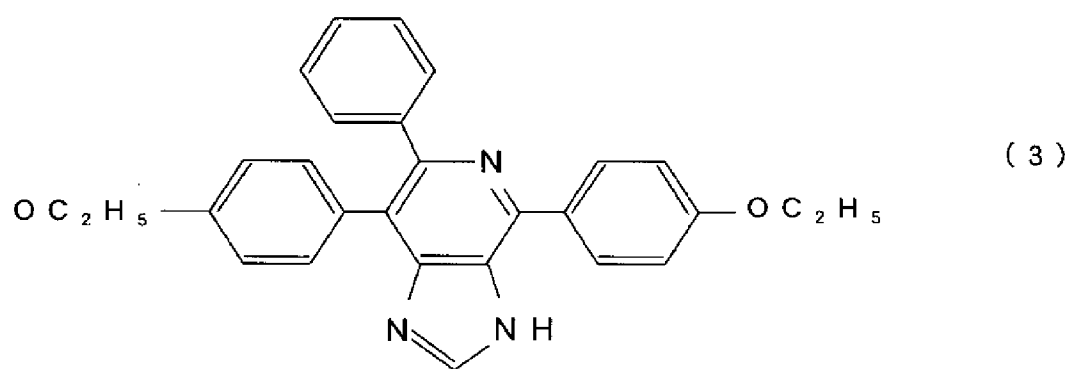
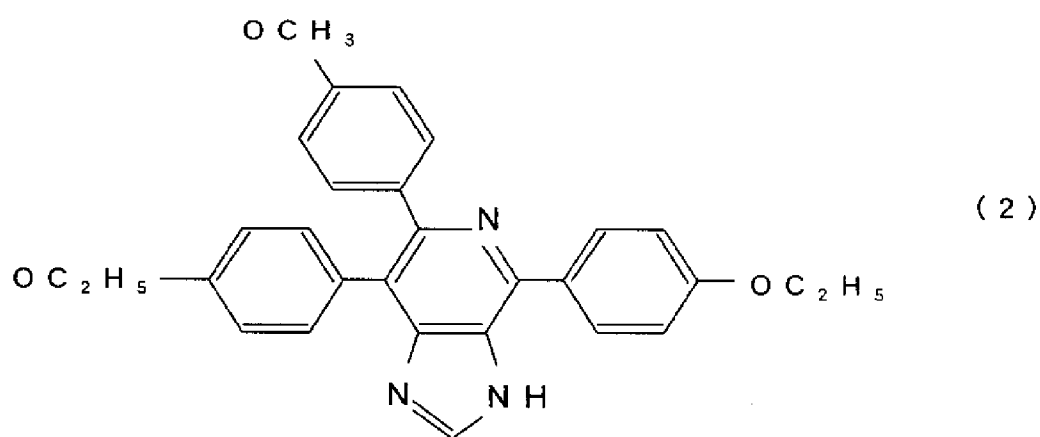
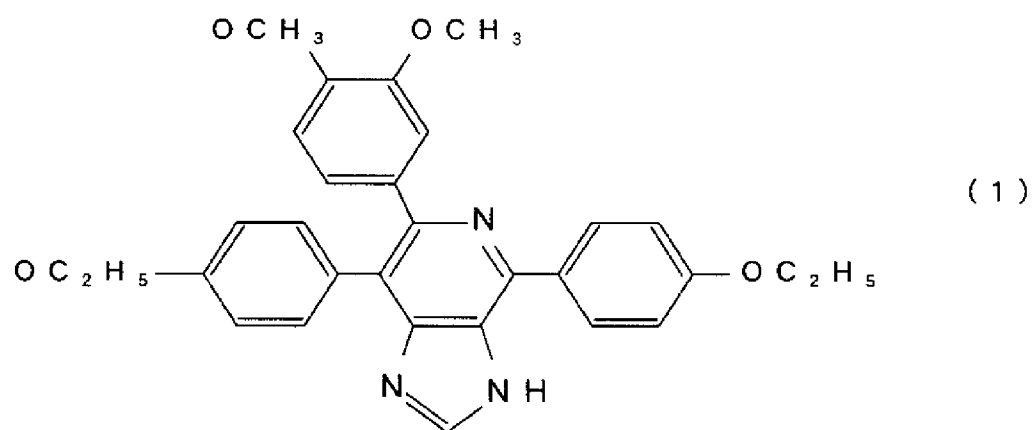
[0051] moreover -- Y is the carbon atom which may have a substituent -- as a substituent -- a hydrogen atom and a cyano group -- or, Amide machine: $-\text{CONH}_2$ denoted by a following formula, $-\text{CONHR}$, $-\text{CORR}'$ () [among a formula] R and R' shows an aromatic hydrocarbon machine or the alkyl groups which may be replaced, such as a phenyl group. Or, Ester group: $-\text{COOR}$ denoted by a following formula (the inside R of a formula.) an aromatic hydrocarbon machine or the alkyl groups which may be replaced, such as a phenyl group, are shown. Or, The alkyl group which has 1-28 carbon atoms, a carboxyl group, the phenyl group which may be replaced, Aromatic hydrocarbon machines, such as a naphthyl group and a phenanthrene machine; aromatic heterocycle machines, such as the thienyl group which may be replaced, a

pyrrolyl machine, a thiazolyl machine, a frill machine, an oxazolyl machine, a benzothienyl group, a benzofuranyl machine, the India Lil machine, and a pyridyl group, etc. are raised.

[0052]As an example of a compound denoted by these general formula (I), the structural formula of compound (1) - (11) is illustrated below.

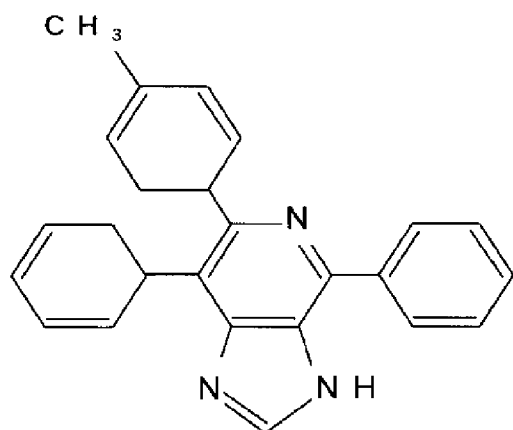
[0053]

[Chemical formula 8]

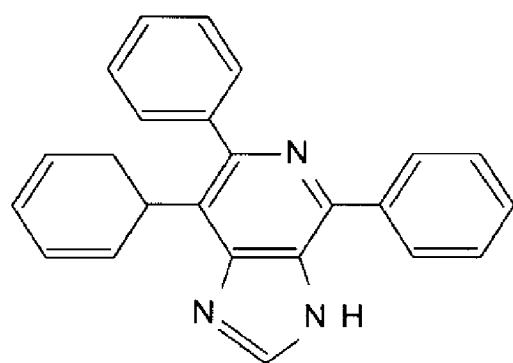


[0054]

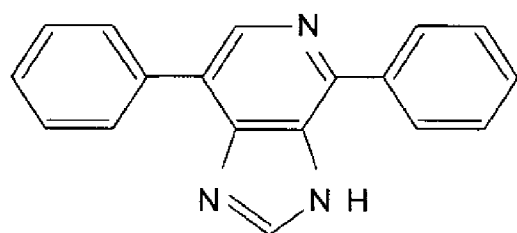
[Chemical formula 9]



(4)



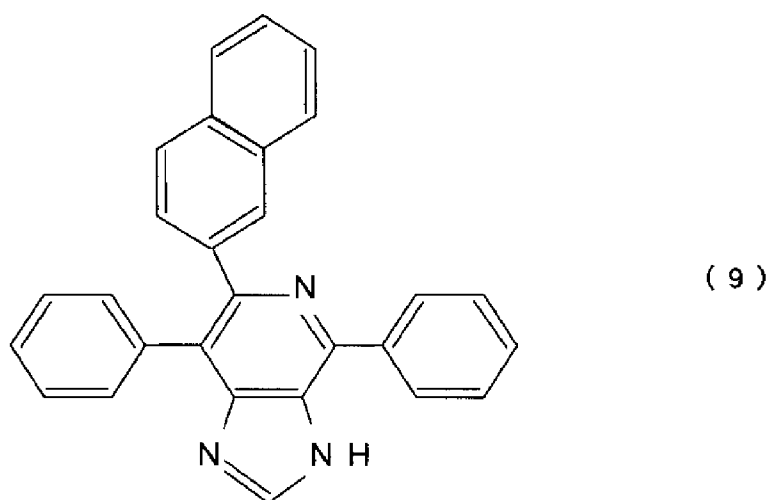
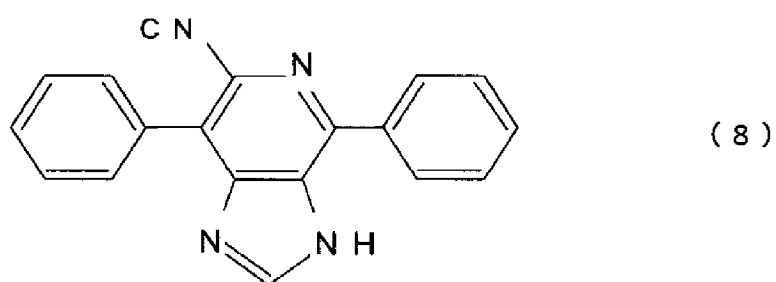
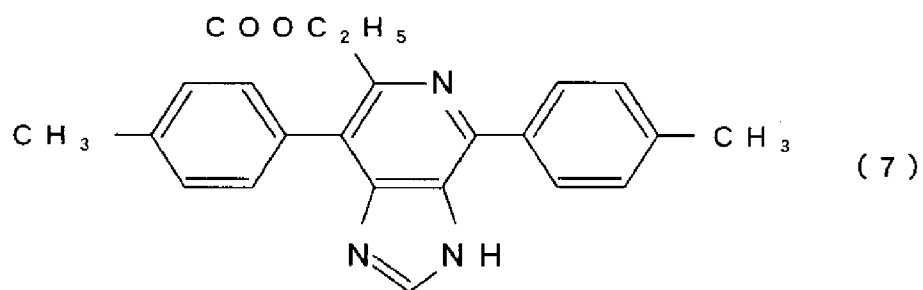
(5)



(6)

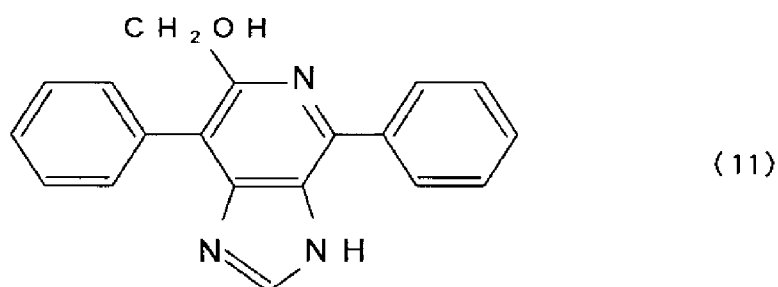
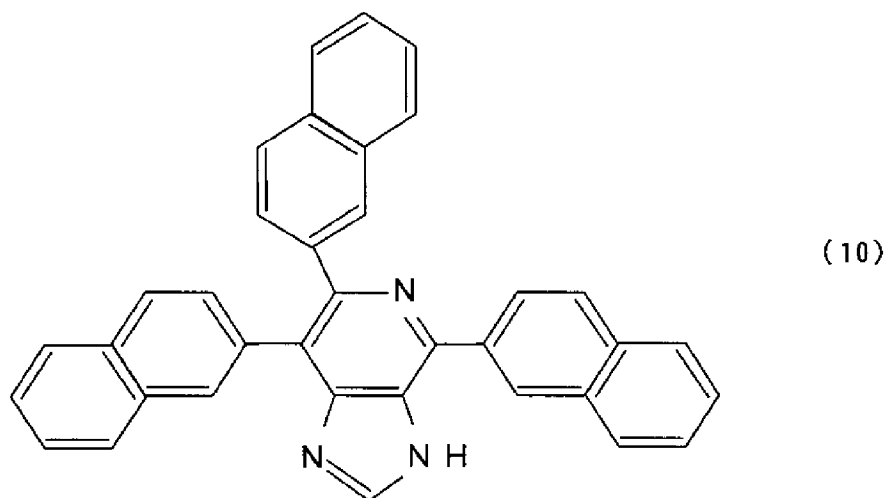
[0055]

[Chemical formula 10]



[0056]

[Chemical formula 11]



[0057] These compounds (1) - (11) all show strong fluorescence and are preferred as compounds of the luminous layer 4. A film thickness of the luminous layer 4 is usually 300-1000 Å, preferably 100-2000 Å. Although the luminous layer 4 can also be formed by the same method as the electron hole pouring transportation layer 3, a vacuum evaporation method is usually used. Although it is well seen to condense the organic thin film formed by the vacuum evaporation method, and deteriorate after prolonged neglect, the organic luminescence compound in this invention is excellent in this point.

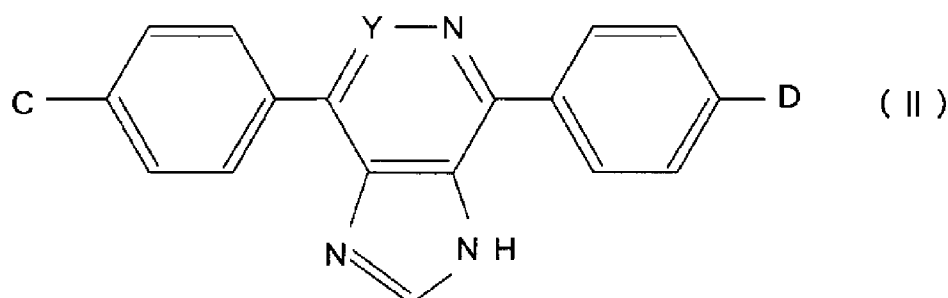
[0058] Next, the 2nd compound of this invention denoted by following general formula (II)

contained in the luminous layer 4 of the organic electroluminescence light emitting element of this invention is explained.

[0059]The organic electroluminescence light emitting element of this invention contains the compound by which the luminous layer 4 is expressed with following general formula (II).

[0060]

[Chemical formula 12]



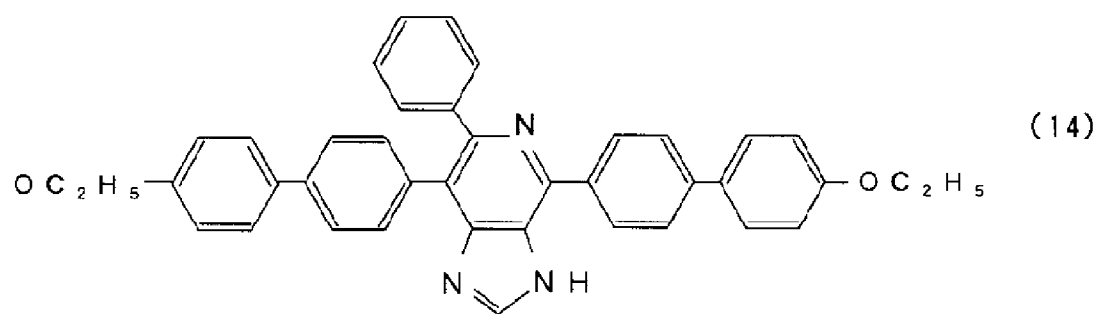
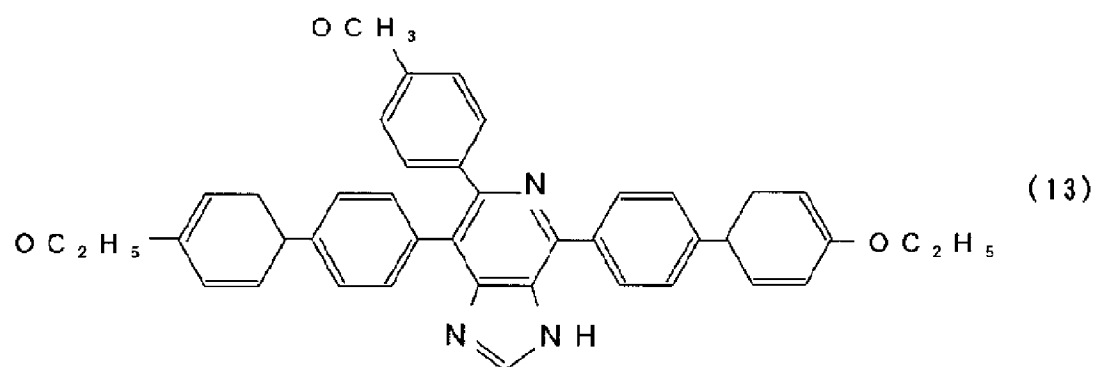
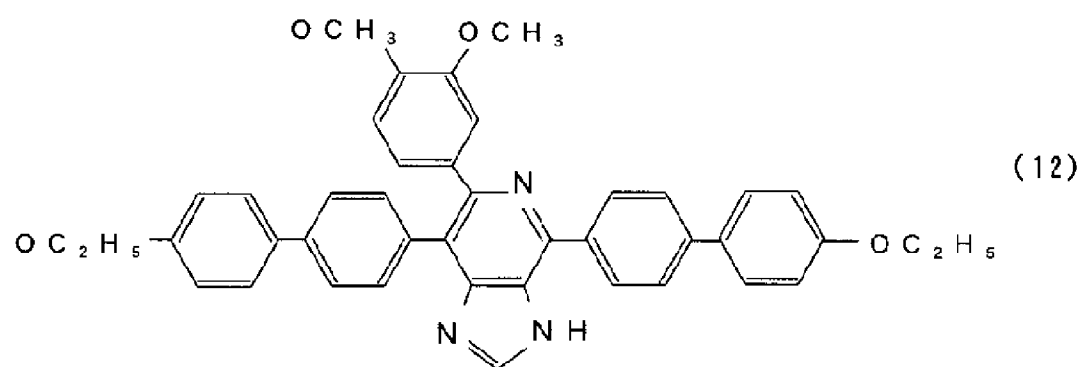
[0061]In general formula (II), C and D show the aromatic series machine which contains in a ring the hetero atom which may have the heterocyclic machine or substituent which may have the aromatic hydrocarbon machine or substituent which may have a substituent, [the aromatic series machine which an aromatic hydrocarbon machine is chosen from a phenyl group, a naphthyl group, a phenan Indanthrene machine, etc., and contains a heterocyclic machine or a hetero atom in a ring] It is chosen out of a benzothiophene machine, the Indore machine, a benzofuran machine, etc., and, [as these substituents] The alkyl group of the carbon numbers 1-6, such as a chlorine atom, a bromine atom, iodine Hitoshi Harako's halogen atom, a methyl group, and an ethyl group, The alkoxycarbonyl group which has an alkoxy group of the carbon numbers 1-6, such as an alkoxy group; methoxy carbonyl group of the carbon numbers 1-6, such as a methoxy group and an ethoxy basis;; A methoxy sulfonyl group, The alkoxy sulfonyl group of the carbon numbers 1-6, such as an ethoxy sulfonyl group; a cyano group, an amino group, a dimethylamino group, a nitro group, etc. are raised.

[0062]Y is the carbon atom which may have a substituent -- as a substituent -- a hydrogen atom and a cyano group -- or, Amide machine: -CONH_2 denoted by a following formula, - CONHR, -CORR' () [among a formula] R and R' shows an aromatic hydrocarbon machine or the alkyl groups which may be replaced, such as a phenyl group. Or, Ester group: -COOR denoted by a following formula (the inside R of a formula.) an aromatic hydrocarbon machine or the alkyl groups which may be replaced, such as a phenyl group, are shown. Or, The alkyl group which has 1-28 carbon atoms, a carboxyl group, the phenyl group which may be replaced, Aromatic hydrocarbon machines, such as a naphthyl group and a phenan trill machine; aromatic heterocycle machines, such as the thienyl group which may be replaced, a pyrrolyl machine, a thiazolyl machine, a frill machine, an oxazolyl machine, a benzothienyl group, a benzofuranyl machine, the India Lil machine, and a pyridyl group, etc. are raised.

[0063]As an example of a compound denoted by these general formula (II), the structural formula of compound (12) - (23) is illustrated below.

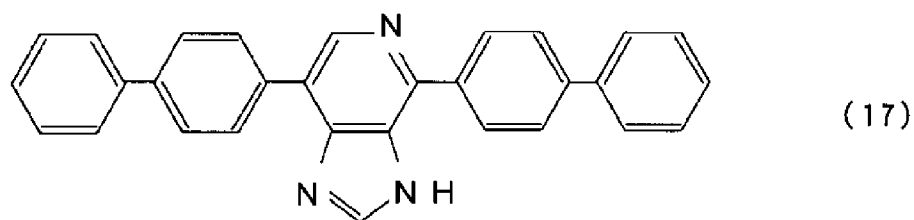
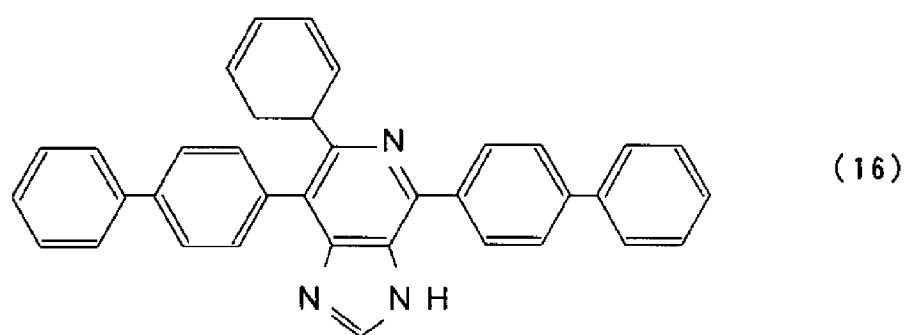
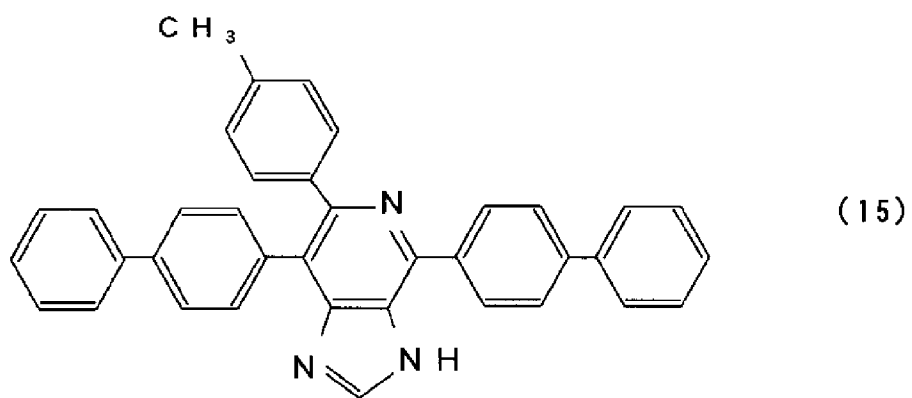
[0064]

[Chemical formula 13]



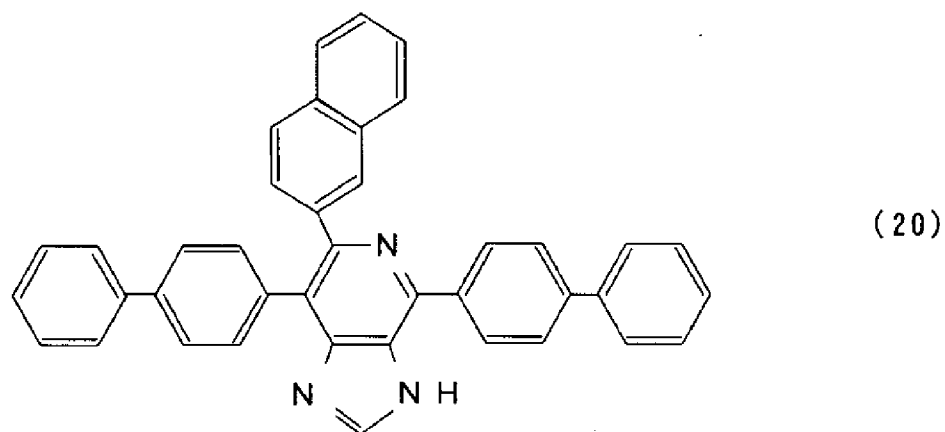
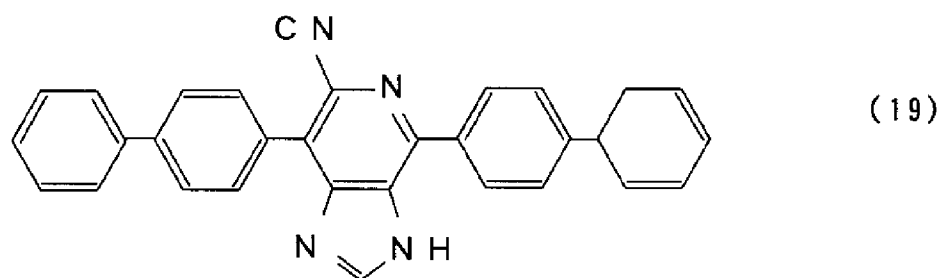
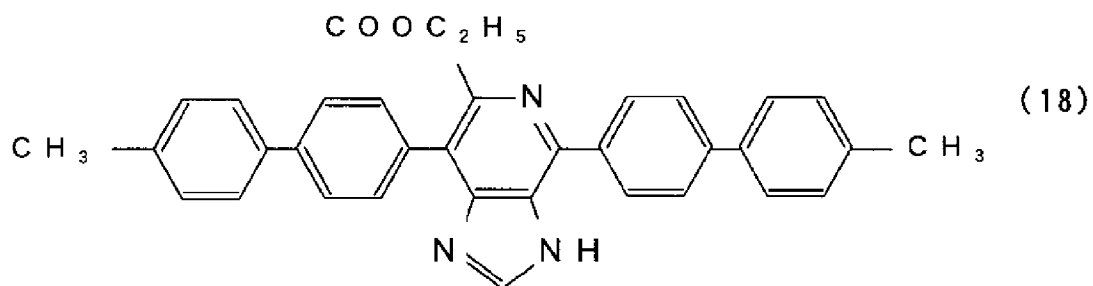
[0065]

[Chemical formula 14]



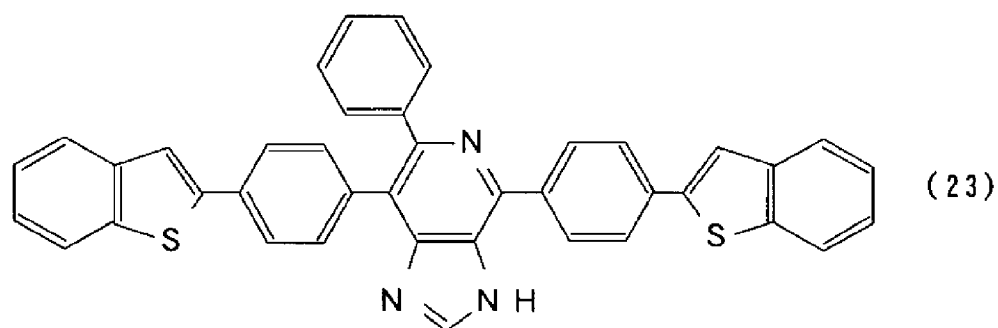
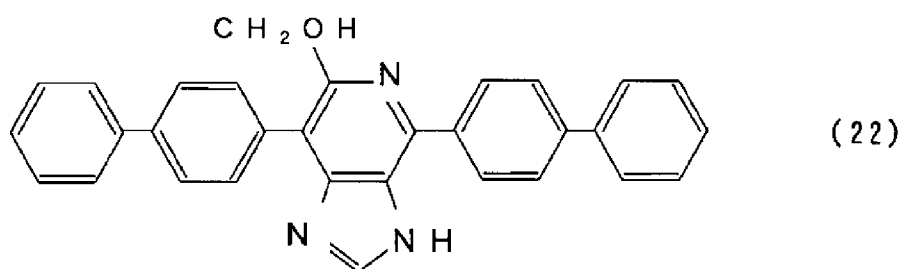
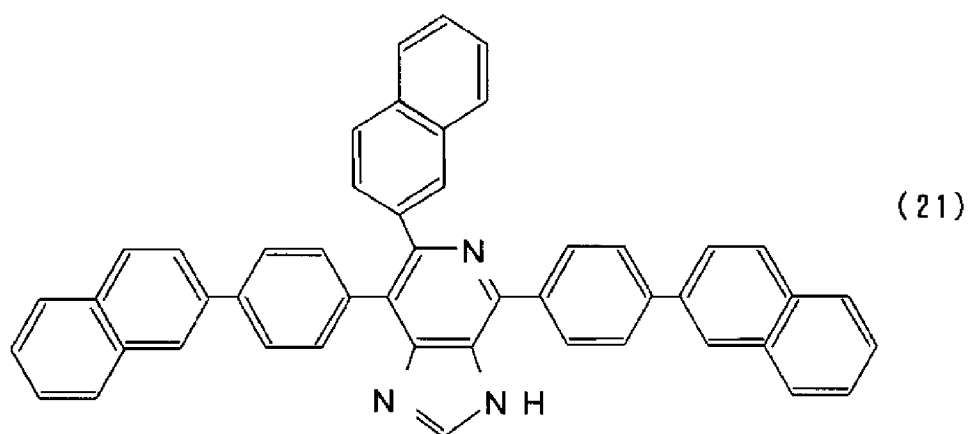
[0066]

[Chemical formula 15]



[0067]

[Chemical formula 16]



[0068] These compounds (12) - (23) all show strong fluorescence and are preferred as a compound of the luminous layer 4. 100-2000 Å of film thickness of the luminous layer 4 is

usually 300-1000Å preferably. Although the luminous layer 4 can also be formed by the same method as the electron hole pouring transportation layer 3, a vacuum evaporation method is usually used. Although it is well seen condense the organic thin film formed by the vacuum evaporation method, and deteriorate after prolonged neglect, the organic luminescence compound in this invention is excellent in this point, and can be created at low cost by a single white luminescent material, and it has the operation that there is no variation per hour of a tint.

[0069]Therefore, it is stabilized by efficient and high luminescence luminosity for a long time, the organic electroluminescence light emitting element of white luminescence in which continuation luminescence is possible can create at low cost by a single white luminescent material, and there is no variation per hour of a tint.

[0070]Next, the synthetic example of the compound of this invention is explained.

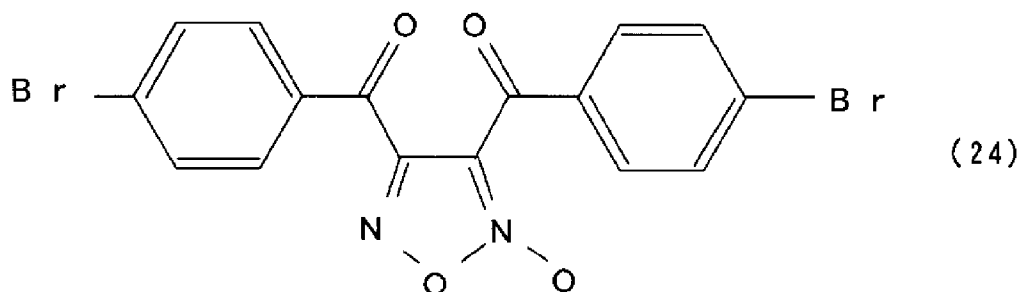
[0071](Synthetic example) In showing the synthetic example of compound (1) - (11) and compound (12) - (23), it represents here and the example of the synthesizing method of a compound (23) is shown.

[0072](1) Composition of N-OKISHIDO object : the mixed solution of 100-ml acetic acid and 90 ml of nitric acid was added to 4-bromo aceto FENON (49.7 g, 0.25 mol) dissolved in 100 ml of acetic acid. It agitated until it opened sodium nitrite (150 mg) after 24-hour churning and in water at room temperature and crystallized. Suction filtration was carried out, the residual substance was melted in CHCl_3 , and it washed in saturation NaHCO_3 solution, and the dryness back was distilled off by MgSO_4 and the solvent was distilled off under decompression. It re-crystallized by CHCl_3 and N-OKISHIDO object (46.3 g, 82%) was acquired.

[0073]Here, the structural formula and characteristic value of N-OKISHIDO object (24) which were acquired are shown.

[0074]

[Chemical formula 17]

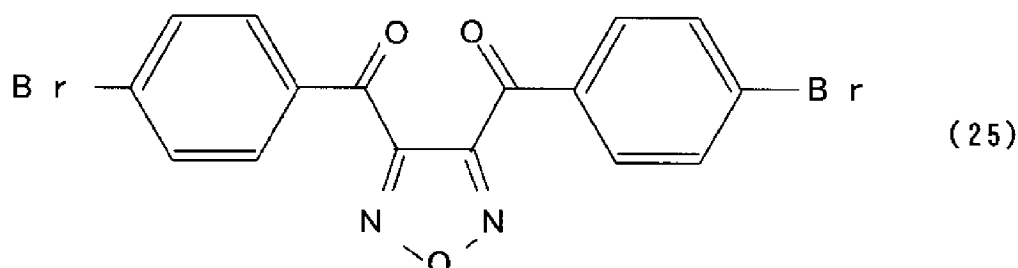


[0075] Colorless. Prisms; mp 136-139 °C (lit. 127-128 °C). IR (KBr) cm^{-1} 1685, 1654, 1619 and 1582, 1470, 1323. EI-MS (M⁺) 450, 452, 454. ¹H-NMR (CDCl₃, ppm). Composition of σ =7.69-7.74 (m, 6H) and a 8.10 (d, 2H) (2) oxadiazole object: N-OKISHIDO object in which 400-ml CH₃CN was dissolved (20 g) Acetic acid (7.0 ml) and an acetic anhydride (20.0 ml) were added to 0.05 mol, and for 10 minutes, after churning, 12.0-g Zn was added in 7 steps so that temperature might not be not less than 40 °C. Disappearance of materials was checked in [TLC] 3 hours, and Zn(OAc)₂ was filtered. Solvent was distilled off, the residual substance was dissolved in CHCl₃, it was washed in 10% HCl solution, saturation NaHCO₃, and saturation NaCl solution, and the solvent was distilled off after dryness by MgSO₄. The oxadiazole object (12.5 g, 65%) made into the purpose was acquired after re-crystallization by CHCl₃.

[0076] Here, the structural formula and characteristic value of an oxadiazole object (25) which were acquired are shown.

[0077]

[Chemical formula 18]

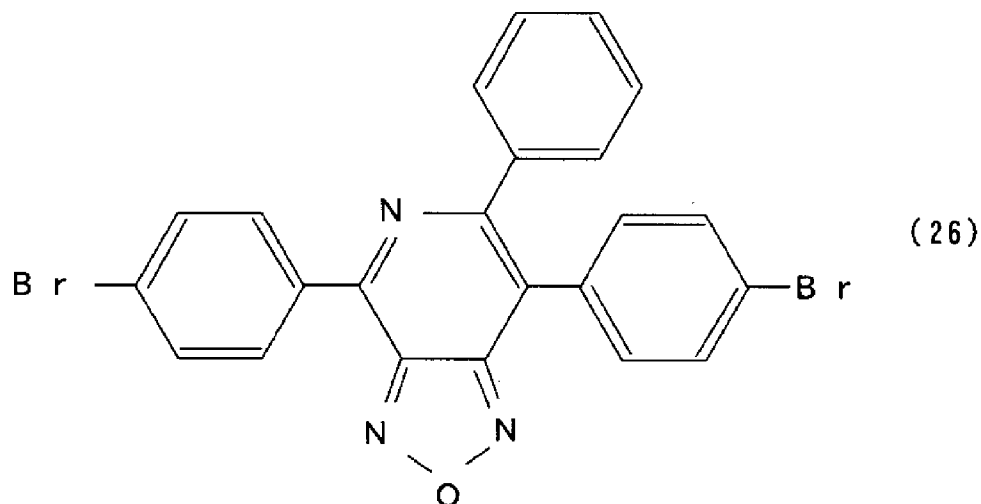


[0078] Colorless. Prisms; mp 111-114 °C (lit. 108-109 °C) IR (KBr) cm^{-1} 1687, 1656, 1582 and 1582, 1297, 1067 EI-MS (M^+) 434, 436, 438 1H-NMR (CDCl_3 , ppm) δ 7.71 (d, 4H, $J = 8.6$ Hz), δ 7.99 (d, 4H, $J = 8.6$ Hz) (3) closed ring reaction (structure after a reaction): Ben Jill Amin (4.28 ml, 0.04 mol) was added to the oxadiazole object (10.0 g, 0.02 mol) in which 200-ml n-BuOH was dissolved. Heating flowing back was carried out at 130 °C for 48 hours. After the end of a reaction, it once distilled off under decompression of n-BuOH, and the residual substance was dissolved in CHCl_3 , it washed in 10% HCl solution, saturation NaHCO_3 , and saturation NaCl solution, and the solvent was distilled off after dryness by MgSO_4 . The closed ring formation (6.3 g, 62%) which has fluorescence was obtained after re-crystallization by CHCl_3 .

[0079] Here, the structural formula and characteristic value of a closed ring formation (26) which were acquired are shown.

[0080]

[Chemical formula 19]

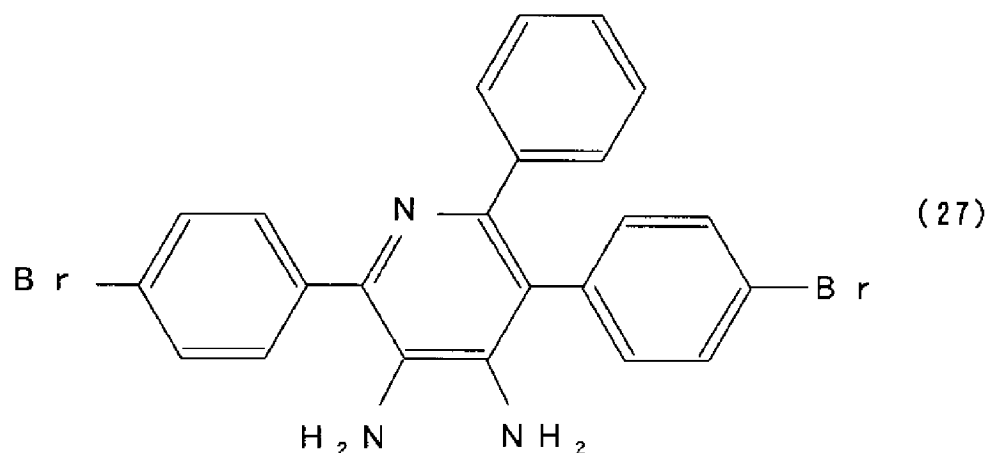


[0081] Orange needles; mp 160-163 °C. IR (KBr) cm^{-1} 1562, 1537, 1510, 1480, 1440, 1417, 1397, and 1369. EI-MS (M^+) 505, 507, 509. $^1\text{H-NMR}$ (CDCl_3 , ppm): δ 7.32-7.42 (m, 5H), 7.49-7.56 (m, 4H), 7.73 (d, 2H) and 8.64 (d, 2H). (4) Gia Min object (** 32): NaBH_4 (373 ml, 0.01 mol) was added to the closed ring formation (1.0 g, 0.002 mol) which made 30-ml EtOH suspended under flowing back. 30 minutes afterward, from TLC, disappearance of materials was checked and reaction liquid was opened in water. The crystal which has deposited was filtered after churning for 30 minutes, and it washed 3 times with water. It re-crystallized by EtOH after dryness under decompression, and the Gia Min object (840 mg, 86%) made into the purpose almost quantitatively was acquired.

[0082] Here, the structural formula and characteristic value of the Gia Min object (27) which were acquired are shown.

[0083]

[Chemical formula 20]



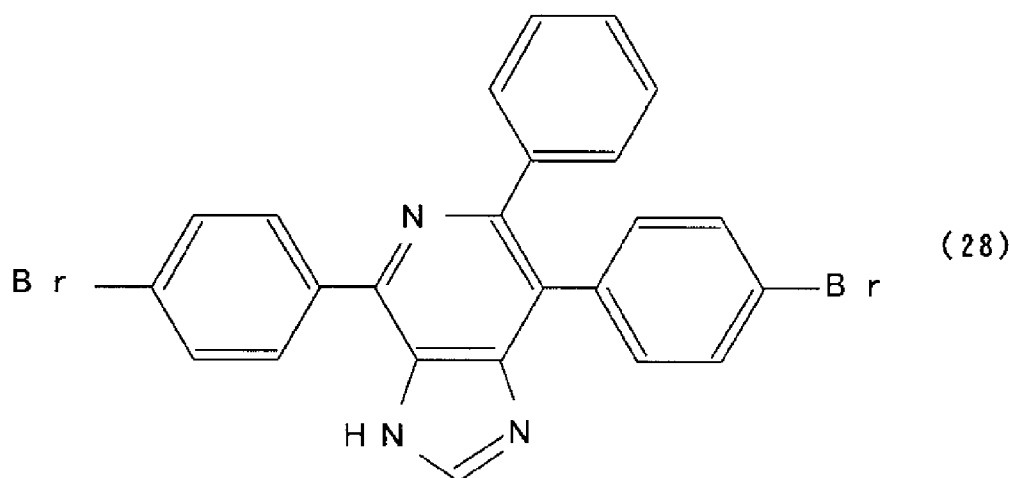
[0084]Colorless Prisms;mp220-224 **IR(KBr) cm⁻¹ 3438,3364,3052, 1426, 1157 EI-MS (M⁺) 493,495,4971 H-NMR (DMSO-d₆, ppm) sigma=4.01 (br, 2H), 5.06 (br, 2H), 7.06-7.14 (m, 7H), and 7.52 (d.) Composition of 2H and a 7.63-7.71(m, 4H)(5) imidazole object:

Concentrated hydrochloric acid (0.1 ml) of the amount of catalysts was added to the Gia Min object (200 mg, 0.40 mol) dissolved in 10 ml of formic acid, and heating flowing back was carried out for 24 hours. After the end of a reaction, reaction liquid was opened in 100 ml of water, it was made base with the ammonia solution, and the crystal which has deposited was filtered. It re-crystallized by THF after dryness under decompression, and the imidazole object (142 mg, 70%) was acquired.

[0085]Here, the structural formula and characteristic value of an imidazole object (28) which were acquired are shown.

[0086]

[Chemical formula 21]

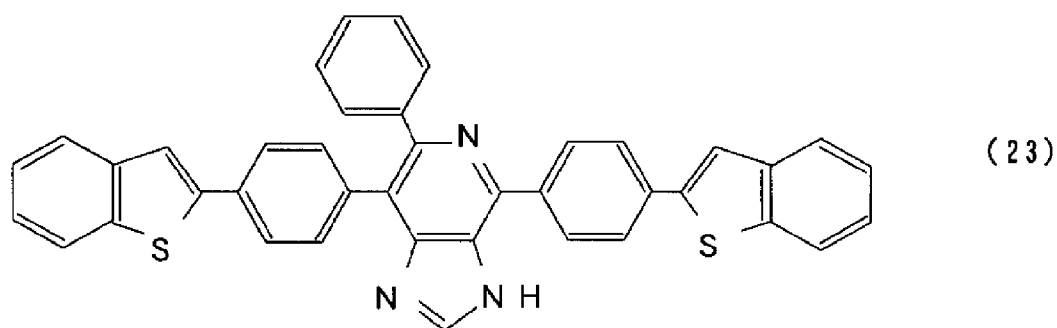


[0087]Colorless Prisms;mp242-245 **IR(KBr) cm⁻¹ 3084,1589,1495 and 1453,1401,1010 EI-MS(M⁺) 503,505,507¹ H-NMR (DMSO-d₆, ppm). sigma=7.27-7.38 (m, 7H), and 7.60 (d, 2H) and 7.76 (d.). On the imidazole object (300 mg, 0.594mmol) dissolved in 15 ml of benzene under 2H and a 8.46(s, 1H)(6) coupling reaction:Ar air current, Na₂CO₃ solution of 2M7ml, The 2-benzo"b" thienyl boron acid (220 mg, 1.48mmol) which adds, and was made to dissolve Pd (pph₃)₄ (77 mg) in 7-ml EtOH continuously was added. Disappearance of materials was checked after [TLC] a 24-hour reaction under heating flowing back, and reaction liquid was opened in water. The precipitated crystal was identified and the compound (23) which is a coupling object (250 mg, 69%) which is re-crystallized after dryness and in THF under decompression, and is made into the purpose was obtained.

[0088]Here, the structural formula of a compound (23) is shown once again, and a characteristic value is shown.

[0089]

[Chemical formula 22]



[0090]Colorless Prisms;mp>400 **:FAB-MS(MH⁺) 612IR(KBr) cm⁻¹ 3398-3090, 1481, 1435, 1187, and 1098 -- in addition, By using a method with the same said of compound (1) - (11) and compound (12) - (22), composition is possible and is not described especially here.

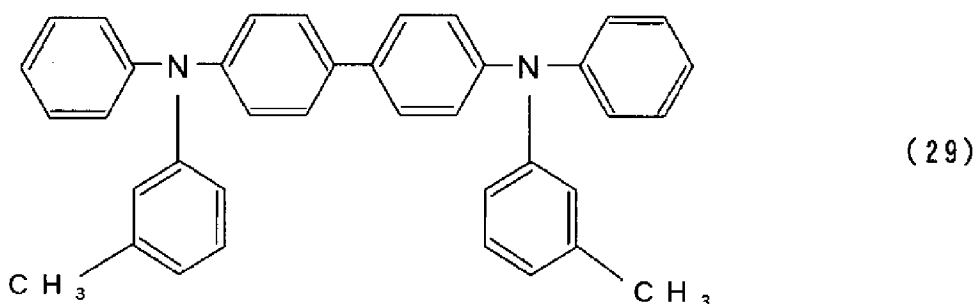
[0091]Next, the work example of this invention is described.

[0092]

[Working example](Work example 1), [as the work example 1 of this invention] [the substrate which formed ITO by a 150 nm sputtering method on the glass substrate] After cleaning ultrasonically with neutral detergent, running water, acetone, and isopropyl alcohol, TPD (29) which shows a structural formula below as a hole injection layer was formed by 50-nm film thickness by the vacuum evaporation method. The degree of vacuum at the time of vapor deposition was 3×10^{-6} Torr.

[0093]

[Chemical formula 23]



[0094]Next, as an organic luminous layer, 50 nm of illustration compounds (1) were vapor-deposited at 0.1-0.2nm/sec of vapor deposition speed, aluminum-Li was continuously vapor-deposited in the vacuum after that, and the element was produced.

[0095]aluminum-Li formed the concentration 15at% of Li aluminum-Li alloy by 200-nm film thickness with 0.5nm/sec of vapor deposition speed from the board made from tungsten, and completed the organic EKUTORO luminescence element. At this time, the conversion efficiency over initial luminance 100 cd/m^2 was 1.5 lm/W . Next, the completed organic EKUTORO luminescence element performed the constant current drive in dry nitrogen, and did the continuation drive examination of the element. Drive conditions were initial luminance 500 cd/m^2 and the drive voltage 9.8V in the constant current drive of 11.5 mA/cm^2 . Measurement of luminosity was measured in the BM-8 luminescent meter by TOPCON CORP. The emission spectrum was measured with the Hamamatsu Photonics multichannel analyzer, and it checked that the luminescence peak of a main was near 470 nm. The luminescence color was blue. The luminosity of the element was reduced by half after the 780-hour continuation drive.

[0096](Work example 2) As the work example 2 of this invention, the substrate by which ITO was formed on the glass substrate was cleaned ultrasonically with neutral detergent, running water, acetone, and isopropyl alcohol. The substrate with ITO used the ITO glass by Asahi Glass [Co., Ltd.] Co., Ltd. (resistance = 10 ohm/sq , 220 nm of film thickness). TPD (29) was formed by 50-nm film thickness by the vacuum evaporation method as a hole injection layer. The degree of vacuum at the time of vapor deposition was $3 \times 10^{-6} \text{ Torr}$.

[0097]Next, as an organic luminous layer, 50 nm of illustration compounds (11) were vapor-deposited at 0.1-0.2nm/sec of vapor deposition speed, aluminum-Li was continuously vapor-deposited in the vacuum after that, and the element was produced. aluminum-Li formed the concentration 15at% of Li aluminum-Li alloy by 200-nm film thickness with 0.5nm/sec of vapor deposition speed from the board made from tungsten, and completed the organic EKUTORO luminescence element. At this time, the conversion efficiency over initial luminance 100 cd/m^2 was 1.7 lm/W . Next, the completed organic EKUTORO luminescence element performed the constant current drive in dry nitrogen, and did the continuation drive examination of the element. Initial luminance 500 cd/m^2 and initial drive voltage of the drive condition were 8.2V in the constant current drive of 10.2 mA/cm^2 . Measurement of luminosity was measured in the BM-8 luminescent meter by TOPCON CORP. The emission spectrum was measured with the Hamamatsu Photonics multichannel analyzer, and it checked that the luminescence peak of a main was 460 nm and near 600 nm. The luminescence color was white. The luminosity of the element was reduced by half after the 830-hour continuation drive. At this time, there was no change in the peak position of the luminescence peak of a main, and relative intensity.

[0098](Work example 3) As the work example 3 of this invention, the substrate by which ITO was formed on the glass substrate was cleaned ultrasonically with neutral detergent, running water, acetone, and isopropyl alcohol. The substrate with ITO used the ITO glass by Asahi Glass [Co., Ltd.] Co., Ltd. (resistance = 10 ohm/sq , 220 nm of film thickness). TPD (29) was formed by 50-nm film thickness by the vacuum evaporation method as a hole injection layer. The degree of vacuum at the time of vapor deposition was $3 \times 10^{-6} \text{ Torr}$.

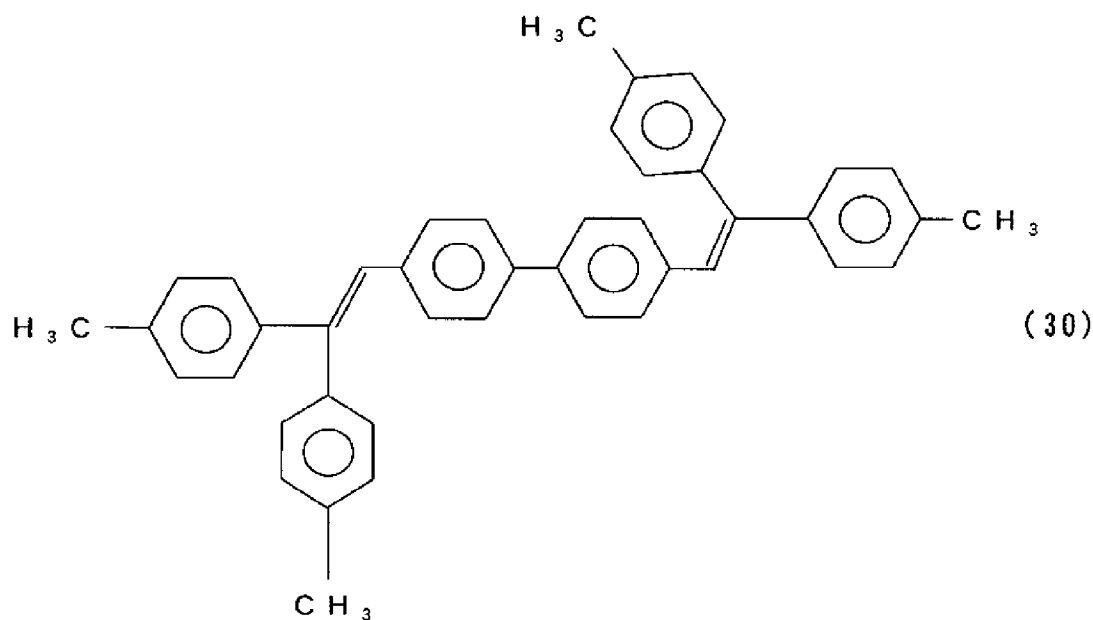
[0099]Next, as an organic luminous layer, 50 nm of illustration compounds (15) were vapor-deposited at 0.1-0.2nm/sec of vapor deposition speed, aluminum-Li was continuously vapor-deposited in the vacuum after that, and the element was produced. aluminum-Li formed the concentration 15at% of Li aluminum-Li alloy by 200-nm film thickness with 0.5nm/sec of vapor deposition speed from the board made from tungsten, and completed the organic EKUTORO luminescence element. At this time, the conversion efficiency over initial luminance 100 cd/m^2 was 1.8 lm/W . Next, the completed organic EKUTORO luminescence element performed the constant current drive, and did the continuation drive examination of the element. Initial luminance 500 cd/m^2 and initial drive voltage of the drive condition were 8.6V in the constant

current drive of 9.5 mA/cm^2 . Measurement of luminosity was measured in the BM-8 luminescent meter by TOPCON CORP. The emission spectrum was measured with the Hamamatsu Photonics multichannel analyzer, and it checked that the luminescence peak of a main was 430 nm and near 560 nm. The luminescence color was white. The luminosity of the element was reduced by half after the 880-hour continuation drive. At this time, there was no change in the peak position of the luminescence peak of a main, and relative intensity.

[0100](Comparative example 1) After cleaning ultrasonically the substrate by which ITO was formed on the glass substrate with neutral detergent, running water, acetone, and isopropyl alcohol, TPD (29) was formed by 50-nm film thickness by the vacuum evaporation method as a hole injection layer. The degree of vacuum at the time of vapor deposition was 3×10^{-6} Torr. BPVBi (30) and the cathode in which the structural formula is shown below as a luminous layer continued in the vacuum in order of aluminum-Li, and produced the element.

[0101]

[Chemical formula 24]

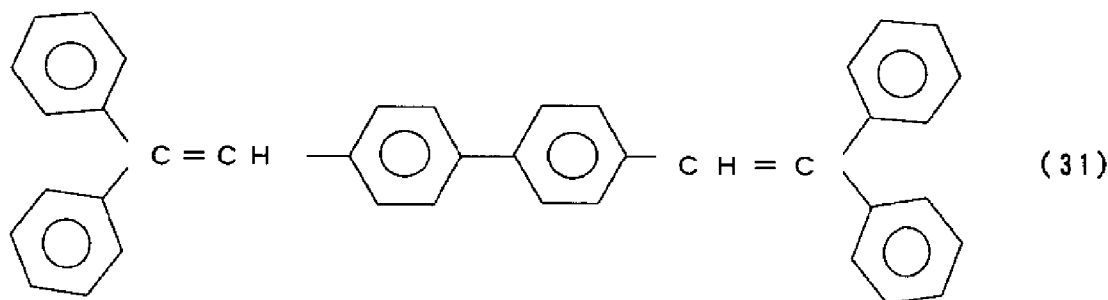


[0102]The substrate with ITO used the ITO glass by Asahi Glass [Co., Ltd.] Co., Ltd. (resistance = 10 ohm/sq, 220 nm of film thickness). What purchased TPD from the bird chemical research institute, and purchased BPVBi from Idemitsu Kosan was used. TPD and BPVBi were vapor-deposited from the vapor deposition board made from tantalum with 0.1-0.2nm/sec of vapor deposition speed, and laminated film thickness (50 nm and 40 nm) in order, respectively. aluminum-Li formed the concentration 15at% of Li aluminum-Li alloy by 200-nm film thickness with 0.5nm/sec of vapor deposition speed from the board made from tungsten, and completed the organic EKUTORO luminescence element. At this time, the conversion efficiency over initial luminance 100 cd/m^2 was 1.1 lm/W . The luminescence color was blue. Next, the completed organic EKUTORO luminescence element performed the constant current drive, and did the continuation drive examination of the element. Initial luminance 500 cd/m^2 and initial drive voltage of the drive condition were 9.1V in the constant current drive of 10.5 mA/cm^2 . Measurement of luminosity was measured in the BM-8 luminescent meter by TOPCON CORP. When the continuation drive examination was done, the luminosity of the element was reduced by half after the 539-hour continuation drive.

[0103](Comparative example 2) After cleaning ultrasonically the substrate by which ITO was formed on the glass substrate with neutral detergent, running water, acetone, and isopropyl alcohol, TPD (29) was formed by 50-nm film thickness by the vacuum evaporation method as a hole injection layer. The degree of vacuum at the time of vapor deposition was $3 \times 10^{-6} \text{ Torr}$. DPVBi (31) and the cathode in which the structural formula is shown below as a luminous layer continued in the vacuum in order of aluminum-Li, and produced the element.

[0104]

[Chemical formula 25]



[0105]The substrate with ITO used the ITO glass by Asahi Glass [Co., Ltd.] Co., Ltd. (resistance = 10 ohm/sq, 220 nm of film thickness). What purchased TPD from the bird chemical research institute, and purchased DPVBi from Idemitsu Kosan was used. TPD and DPVBi were vapor-deposited from the vapor deposition board made from tantalum with 0.1-0.2nm/sec of vapor deposition speed, and laminated film thickness (40 nm and 75 nm) in order, respectively. aluminum-Li formed the concentration 15at% of Li aluminum-Li alloy by 200-nm film thickness with 0.5nm/sec of vapor deposition speed from the board made from tungsten, and completed the organic EKUTORO luminescence light emitting element. At this time, the conversion efficiency over initial luminance 100 cd/m^2 was 0.8 lm/W . The luminescence color was blue. Next, the completed organic EKUTORO luminescence element performed the constant current drive, and did the continuation drive examination of the element. Initial luminance 500 cd/m^2 and initial drive voltage of the drive condition were 10.1V in the constant current drive of 10.8 mA/cm^2 . Measurement of luminosity was measured in the BM-8 luminescent meter by TOPCON CORP. When the continuation drive examination was done, the luminosity of the element was reduced by half after the 625-hour continuation drive. The tint of luminescence was changing to greenishness.

[0106]

[Effect of the Invention]As mentioned above, according to this invention, blue and the efficient organic EKUTORO luminescence light emitting element of white luminescence are obtained, and the continuation driving stability improves sharply and the advantageous effect that attenuation of initial luminance is eased over a long time is acquired.

[0107]Blue luminescence and white luminescence are obtained with single material, and it has the effect that there is no variation per hour of the tint.

[0108]And it is an efficient organic electroluminescence light emitting element in which blue luminescence and white luminescence by a single luminescent material are possible, and it is producible at low cost for a single material, and it is stabilized by high luminescence luminosity

for a long time, and the organic electroluminescence light emitting element in which continuation luminescence is possible can be provided.

[Brief Description of the Drawings]

[Drawing 1]The important section sectional view of the organic electroluminescence light emitting element in the 1 embodiment of this invention

[Explanations of letters or numerals]1 Substrate 2 anode 3 electron-hole transportation layer 4 luminous-layer 5 Negative pole

[Translation done.]